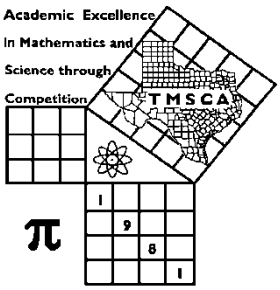


TMSCA MIDDLE SCHOOL MATHEMATICS

TEST #7 ©

JANUARY 14, 2023

GENERAL DIRECTIONS

1. About this test:
   A. You will be given 40 minutes to take this test.
   B. There are 50 problems on this test.
2. All answers must be written on the answer sheet/Scantron form/Chatsworth card provided. If you are using an answer sheet be sure to use **BLOCK CAPITAL LETTERS**. Clean erasures are necessary for accurate grading on Scantrons and Chatsworth cards.
3. If you are using a Chatsworth or Scantron card, please follow the specific instructions given at your particular meet.
4. You may write anywhere on the test itself. You must write only answers on the answer sheet.
5. You may use additional scratch paper provided by the contest director.
6. All problems have **ONE** and **ONLY ONE** correct [BEST] answer. There is a penalty for all incorrect answers.
7. Calculators **MAY NOT** be used on this test.
8. All problems answered correctly are worth **FIVE** points. **TWO** points will be deducted for all problems answered incorrectly. No points will be added or subtracted for problems not answered.
9. In case of ties, percent accuracy will be used as a tie breaker.

2022 – 2023 TMSCA Middle School Mathematics Test #7

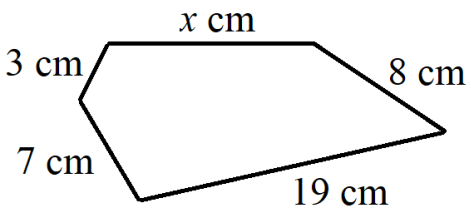
1. 34.199 + 17.267 = _____ (nearest tenth)
A. 51.43 B. 51.45 C. 51.4 D. 51 E. 51.5

2. 804 – 245 – 177 = _____
A. 396 B. 398 C. 382 D. 376 E. 374

3. $23 \times (65 - 49)$ = _____
A. 368 B. 392 C. 1,446 D. 1,062 E. 736

4. $8\frac{5}{6} \div 1\frac{1}{2}$ = _____
A. $7\frac{1}{3}$ B. $5\frac{8}{9}$ C. $6\frac{2}{3}$ D. $6\frac{8}{9}$ E. $5\frac{2}{3}$

5. What is the value of *x*, if the perimeter of the pentagon below is 53 cm?



A. 15 cm B. 12 cm C. 13 cm D. 14 cm E. 16 cm

6. If $2n = 56$, what is the value of $5n - 7$?
A. 553 B. 112 C. 133 D. 147 E. 191

7. The point $(-3, 8)$ is reflected over the *x*-axis and then reflected across the *y*-axis. What are the new coordinates of the point after both reflections?
A. $(8, -3)$ B. $(-8, -3)$ C. $(3, 8)$ D. $(3, -8)$ E. $(-3, -8)$

8. 45,000 milliliters = _____ hectometers
A. 0.45 B. 4.5 C. 45 D. 0.045 E. 45,000,000

9. $2^2 \cdot 3^2 \cdot 5^2 \cdot 11$ is the prime factorization of which number?
A. 3,960 B. 21,780 C. 9,900 D. 4,950 E. 3,300

10. What is the next term of the sequence 4, 5, 6, 15, 26, 47, 88, …?
A. 129 B. 145 C. 161 D. 176 E. 103

11. 6! = _____
A. 120 B. 720 C. 900 D. 30 E. 600

12. Which list shows the numbers in order form greatest to least?
A. $-8, -3, 9, 3$ B. $9, -8, -3, 3$ C. $9, -8, 3, -3$ D. $-8, -3, 3, 9$ E. $9, 3, -3, -8$

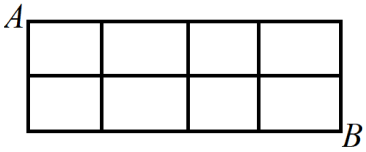
13. DVI + CDLII = _____ (Roman numeral)
A. CMLVIII B. CMLXIV C. DCCCLVIII D. DLXXXVIII E. CCCLXXII

14. Which list of angle measures could be the angle measures of a triangle?
A. $90^\circ, 45^\circ, 25^\circ$ B. $30^\circ, 65^\circ, 85^\circ$ C. $40^\circ, 85^\circ, 35^\circ$ D. $15^\circ, 95^\circ, 80^\circ$ E. $5^\circ, 75^\circ, 125^\circ$

15. If Samantha bought eleven movie tickets and her total was $138.60, then what was the unit rate per ticket?
A. $11.80 B. $12.80 C. $11.60 D. $12.20 E. $12.60

16. What is the positive difference of the GCF of 45 and 70, and the LCM of 42 and 84?
A. 79 B. 88 C. 42 D. 16 E. 32

17. Moving only down and/or to the right, how many paths exist from point *A* to point *B*?



A. 11 B. 9 C. 10 D. 15 E. 18

18. For every 3 pounds of pecans Harry picks, he will make $4.00. How much will Harry make in total if he picks 39 pounds of pecans?
A. $60.00 B. $52.00 C. $55.00 D. $48.00 E. $56.00

19. Which of the following is not equivalent to $14^2 - 100 + 18$?
A. 2×59 B. 6×19 C. 3×38 D. $2(34 + 23)$ E. $(24 - 5)(4 + 2)$

20. Yanni wants to bake some brownies using a recipe that has a total of 250 calories for 8 servings. Yanni is having more friends over than she anticipated, so she tripled her brownie recipe. How many total calories will be in Yanni's brownies?
A. 1,500 calories B. 1,250 calories C. 750 calories D. 1,000 calories E. 900 calories

21. Let *A* equal the number of diagonals that can be drawn from one vertex of a regular pentagon and let *B* equal the number of diagonals that can be drawn from one vertex of a regular dodecagon. Find $B - A$.
A. 2 B. 9 C. 11 D. 4 E. 7

22. Cassie is buying a shirt that costs $19.00. If tax is 8%, what is the total price Cassie will pay after tax?
A. $20.14 B. $20.46 C. $20.18 D. $20.52 E. $20.33

23. What is the sum of all the distinct positive factors of the number 100?
A. 217 B. 117 C. 227 D. 178 E. 226

24. If the circumference of a circle is 24π inches, what is the area of the circle, in terms of π?
A. 144π inch^2 B. 576π inch^2 C. 288π inch^2 D. 432π inch^2 E. 224π inch^2

25. If digits can repeat, how many 3-digit numbers can be formed using the digits 2, 3, and 4?
A. 6 B. 9 C. 27 D. 81 E. 12

26. 537_{10} = _____ (base 9)
A. 546 B. 631 C. 656 D. 684 E. 648

27. 5 miles = _____ yards
A. 26,400 B. 21,120 C. 10,560 D. 7,040 E. 8,800

28. What is the probability of drawing a red four from a standard deck of cards on the first pick and then, with replacement, drawing a king on a second pick?
A. $\frac{1}{169}$ B. $\frac{1}{338}$ C. $\frac{2}{169}$ D. $\frac{3}{26}$ E. $\frac{2}{169}$

29. 721×10^{-15} = _____ (scientific notation)
A. 7.21×10^{-17} B. 7.21×10^{17} C. 7.21×10^{3} D. 7.21×10^{-13} E. 7.21×10^{2}

30. What percentage of the positive integral divisors of 500 are multiples of 25?
A. 75% B. $41\frac{2}{3}\%$ C. 25% D. 5% E. 50%

31. $\angle B$ is the complement of $\angle A$ and the supplement of $\angle C$. If $m\angle A + m\angle C = 186^{\circ}$, then $m\angle B =$ ____$^{\circ}$.
A. 36 B. 42 C. 34 D. 44 E. 48

32. 75 *mi/hr* = _____ *ft/sec*
A. 120 B. 110 C. 115 D. 125 E. 105

33. What is the value of the inter-quartile range of the set of numbers 12, 17, 17, 21, 23, 29, and 38?
A. 12 B. 26 C. 21 D. 46 E. 17

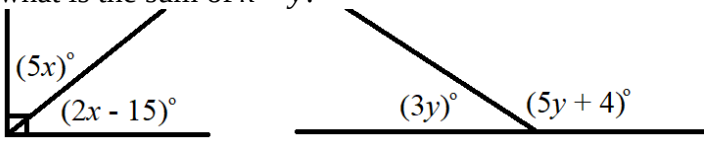
34. $\{2,4,6,8,10,12\} \cap \{1,3,5,7,9,11\} \cup \{1,2,3,4,5\} =$ _____
A. $\{2,4,6\}$ B. $\{1\}$ C. $\{1,2,3,4,5\}$ D. $\{1,2,3\}$ E. $\{1,2,3,4,5,6,7,8,9,10,11,12\}$

35. What is the equation $6x - 2y = 30$ solved for *y*?
A. $y = \frac{1}{3}x - 15$ B. $y = 3x - 15$ C. $y = -3x - 15$ D. $y = -\frac{1}{3}x - 15$ E. $y = \frac{1}{3}x + 15$

36. If $n = -2$, what is the slope of the line passing through the points $(n, -6)$ and $(3n, -n)$?
A. $-\frac{1}{2}$ B. 1 C. -2 D. -3 E. $\frac{1}{2}$

37. Evelyn opens a book and the two page numbers she sees sum to 137. What is the product of the two numbers Evelyn sees?
A. 4,623 B. 4,556 C. 4,488 D. 4,899 E. 4,692

38. Using the picture below, what is the sum of *x* + *y*?



A. 13 B. 15 C. 35 D. 37 E. 57

39. $3(2m - 5)(4m - 1)$ = _____
A. $24m^2 - 22x + 5$ B. $24m^2 - 66m + 15$ C. $8x^2 - 22x + 5$ D. $8m^2 - 66m + 15$ E. $12m^2 - 22m + 15$

40. What is the discriminant of the quadratic equation $6x^2 - 5x = -8$?
A. -124 B. -56 C. -167 D. 217 E. 196

41. A square is graphed on a coordinate plane. The coordinates of two of the vertices of the square are $(-1, -2)$ and (3, 1). What is the distance between the two vertices?
A. 5 units B. 6 units C. 8 units D. 4 units E. 3 units

42. If $x^2 < 25$, what is the sum of all positive integers, *x*, that satisfy the inequality?
A. 10 B. 15 C. 14 D. 325 E. 33

43. Three spirals and two notebooks cost \$21.50. Two spirals and five notebooks cost \$34.50. How much will eight notebooks cost?
A. \$49.50 B. \$28.00 C. \$33.00 D. \$45.50 E. \$44.00

44. In the picture below, Figure A is made of six 1-inch cubes and Figure B is made of four 2-inch cubes. How much larger is the surface area of Figure B than Figure A?

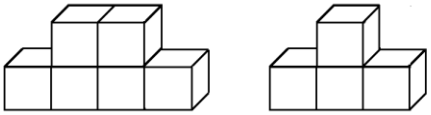


Figure A Figure B

A. 72 in^2 B. 36 in^2 C. 24 in^2 D. 48 in^2 E. 28 in^2

45. How may combinations can be made of 14 items taken 11 at a time?
A. 2,184 B. 364 C. 1,092 D. 546 E. 273

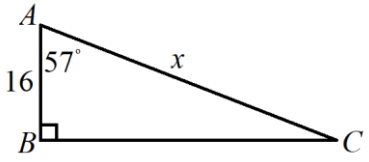
46. $\left(\frac{24a^2b^3}{6ab}\right)\left(\frac{18ab^{-4}}{9a^{-3}}\right)(4a^{-3}b^{-2}) =$ _____

A. $\frac{32a^2}{b^4}$ B. $\frac{144a^2}{b^4}$ C. $\frac{32a}{b^3}$ D. $\frac{32b^2}{a}$ E. $\frac{144b^4}{b^2}$

47. If *y* varies directly as *x*, and *y* = 160 when *x* = 40, what is the value of *x* when *y* = 8?
A. 160 B. 320 C. 4 D. 16 E. 2

48. If $x + \frac{1}{x} = 9$, find the value of $x^2 + \frac{1}{x^2}$.
A. 18 B. 36 C. 81 D. 79 E. 17

49. Which of the following trig functions can be used to find the length *x* from the picture?



A. $\sin(57) = \frac{x}{16}$ B. $\tan(57) = \frac{x}{16}$ C. $\cos(57) = \frac{16}{x}$ D. $\sin(57) = \frac{16}{x}$ E. $\tan(57) = \frac{16}{x}$

50. In terms of π, what is the area of the circle with the equation $x^2 + 24x + y^2 + 6y - 57 = 80$?
A. 290π units^2 B. 317π units^2 C. 144π units^2 D. 230π units^2 E. 413π units^2

2022 – 2023 TMSCA Middle School Mathematics Test #7 Answer Key

1. E
2. C
3. A
4. B
5. E
6. C
7. D
8. A
9. C
10. C
11. B
12. E
13. A
14. B
15. E
16. A
17. D
18. B
19. A
20. C
21. E
22. D
23. A
24. A
25. C
26. C
27. E
28. B
29. D
30. E
31. B
32. B
33. A
34. C
35. B
36. C
37. E
38. D
39. B
40. C
41. A
42. A
43. E
44. D
45. B
46. A
47. E
48. D
49. C
50. A

2022 – 2023 TMSCA Middle School Mathematics Test #7 Selected Answers

6. To solve the equation $2n = 56$, divide both sides of the equation by 2 to get a value of $n = 28$. To find the value of $5n - 7$, substitute 28 in place of n, which equals $5(28) - 7 = 140 - 7 = 133$.

10. The given sequence follows the pattern *a, b, c, d, e, …*, where $d = a + b + c$, and $e = b + c + d$. To get the next term of the sequence after the 3rd term, add the previous three terms. So, given the sequence 4, 5, 6, 15, 26, 47, 88, …, the next term of the sequence is equal to 26 + 47 + 88 = 161.

14. There are 180° in a triangle, so the only set of numbers that sum to 180° is $30^\circ, 65^\circ, 85^\circ$.

22. \$19.00 plus 8% tax is equal to 19 + 19(0.08) = 19 + 1.52 = \$20.52.

23. The positive factors of 100 are 1, 2, 4, 5, 10, 10, 20, 25, 50, and 100. However, the distinct positive factors are 1, 2, 4, 5, 10, 20, 25, 50, and 100, so their sum is 1 + 2 + 4 + 5 + 10 + 20 + 25 + 50 + 100 = 217.

27. If 1 mile = 1,760 yards, then 5 miles = 5(1,760) = 8,800 yards.

37. Let a and b be the two page numbers. The sum of the two page numbers is 137, so $\frac{137}{2} = 68.5$. This means that $a = 68$ and $b = 69$, because 68 + 69 = 137. Therefore, the product of a and $b = ab = (68)(69) = 4{,}692$.

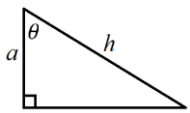
39. $3(2m-5)(4m-1) = 3(8m^2 - 20m - 2m + 5) = 3(8m^2 - 22m + 5) = 24m^2 - 66m + 15.$

42. The positive integers satisfying $x^2 < 25$, are 1, 2, 3, and 4. Therefore, 1 + 2 + 3 + 4 = 10.

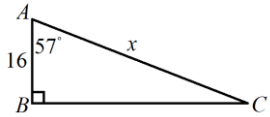
45. The formula for finding the number of combinations of n items taken r at a time is $\frac{n!}{r!(n-r)!}$. In the given problem, 14 items taken 11 at a time, means $n = 14$ and $r = 11$. Substituting into the formula gives $\frac{14!}{11!(14-11)!} = \frac{14!}{11!(3)!} = \frac{14 \cdot 13 \cdot 12}{3 \cdot 2 \cdot 1} = \frac{2184}{6} = 364$. 364 combinations can be made from 14 items taken 11 at a time.

48. Given $x + \frac{1}{x} = 9$, we are asked to find the value of $x^2 + \frac{1}{x^2}$. Squaring both sides of $x + \frac{1}{x} = 9$ produces $\left(x + \frac{1}{x}\right)^2 = 9^2 \rightarrow x^2 + 2 + \frac{1}{x^2} = 81$. This can be rewritten as $x^2 + \frac{1}{x^2} + 2 = 81$. Subtracting 2 from both sides of the equation gives the value of $x^2 + \frac{1}{x^2} = 79$.

49. Label the right triangle as shown.



In the picture, θ is the angle measure, a is the adjacent side of θ and h is the hypotenuse. The trig function that uses the adjacent leg and hypotenuse is cosine. The function is $\cos(\theta) = \frac{a}{h}$, because $\cos(\theta) = \frac{adjacent\ leg}{hypotenuse}$. Looking at the given picture,



$\theta = 57$, $a = 16$, and $h = x$. Substituting into the function gives the trig function of $\cos(57) = \frac{16}{x}$.